REMARKS

Claims 1-48 are pending and at issue. These claims all stand rejected under prior art rejections based on *Chen* (USPN 6,433,911) alone or in combination with *Kimura* (USPN 6,288,829). The applicants have carefully considered these documents and the rejections, but respectfully traverse in light of the above amendments and below-outlined remarks. Reconsideration is requested.

Independent Claim 1

As amended, claim 1 recites an optical switch that has a substrate for transmitting an optical signal, wherein the optical signal propagates in the substrate in a first propagation direction along a first plane. The optical switch also has a diffractive optical element disposed above a top surface of the substrate and moveable relative thereto between a first position substantially out of evanescent field coupling with the optical signal and a second position in evanescent field coupling with the optical signal to alter the propagation of the optical signal in the substrate "into a second propagation direction along a second plane that forms an acute angle with the first plane." None of the art of record teaches or suggests the recited subject matter.

The office action principally relies upon *Chen* and element 205 as teaching the recited diffractive optical element. Yet, while element 205 may be a movable membrane that affects light, that element is clearly not the recited diffractive optical element. The element 205, as with all the membranes of *Chen*, selectively reflects or transmits light but does not diffract light. Instead, as *Chen* illustrates in figures 1 and 2 and correspondingly describes, its membranes merely affect whether the device is operating under total internal reflection, frustrated total internal reflection, or complete transmission.

In *Chen's* device, an incoming broadband signal is separated into different wavelength components via a transmission grating 118—a diffractive element. Each wavelength component is spatially separated and aligned with a single corresponding actuator, of which element 205 is an example. When the corresponding actuator for a wavelength component is at a sufficiently large distance from substrate, e.g., out of evanescent field coupling, that wavelength component will continue to propagate under total internal reflection. However, as the corresponding actuator is brought closer to the substrate, e.g., within evanescent field coupling, the amount of reflected energy begins to decrease until eventually the wavelength component is completely dropped, i.e., transmitted

through the substrate, as shown in figure 3 of *Chen*. At this point, the wavelength component then reflects off the top surface of actuator (see, e.g., figure 10).

Chen uses this reflectivity control to create optical modulators (see, e.g., col. 7, l. 26-38) and optical add/drop multiplexers (see, e.g., col. 8, ll. 45 et seq.). Yet, in none of these examples does *Chen* use its actuators as diffractive optical elements. The only diffractive elements described in *Chen* are the gratings 118 and 218, e.g., and these are conspicuously not movable.

The deficiencies of *Chen* are also demonstrated by the direction of light after the light has encountered an actuator. With *Chen*, after light encounters an actuator, that light is coupled out of substrate but continues to propagate along the same plane of propagation as the incident light. That is, regardless of the position of *Chen's* actuator, the reflected light and the incident light share the same direction of propagation and move along the same plane.

The present application, however, illustrates and describes various techniques in which an incoming signal may have one direction of propagation along a first plane when a diffractive optical element is in a first position, and a different direction of propagation along another plane when the diffractive optical element is in a second position. For illustrative purposes, and not limitation, FIG. 4A shows an example apparatus in which a signal may be moved from a first direction of propagation along a first plane to a different direction of propagation along a second plane via a diffractive optical element. *Chen* by contrast shows signals that travel in a single plane (the plane of the paper).

In any event, with respect to the claim 1, it is clear from the foregoing that the actuators of *Chen* are not diffractive optical elements "disposed above a top surface of the substrate and moveable relative thereto between a first position substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second position in evanescent field coupling with the optical signal to alter the propagation of the optical signal in the substrate into a second propagation direction along a second plane that forms an acute angle with the first plane," as recited in claim 1. The rejection of claim 1 is therefore improper and should be withdrawn.

The office action additionally rejects numerous claims depending from claim 1 as obviousness based on *Chen* alone or *Chen* in combination with *Kimura*. With respect to

the former, the applicants have noted above that *Chen* does not teach the subject matter of claim 1. Further, there is no teaching, suggestion, or motivation to convert *Chen* into the recited subject matter. These obviousness rejections are traversed for at least the reasons outlined above, as a result. With respect to the latter, and tabling the question of whether the office action has set forth a sufficient *prima facie* showing, even if the two references could be combined the combination would not teach the recited subject matter, as neither *Chen* nor *Kimura* teach the recited diffractive optical element.

The applicants further note that numerous dependent claims stand rejected based on various official notices made by the examiner. The applicants respectfully submit that because the rejections upon which these official notices have been based are in fact legally improper, the official notices are premature. As a result, the applicants have not separately addressed these statements, but rather reserve the right to separately address them if they are maintained.

<u>Independent Claim 27</u>

Claim 27 recites a holographic optical element that includes a plurality of spaced-apart strips disposed above a top surface of a substrate such that the strips collectively receive a first portion of a light signal and "produce an output signal phase shifted from a second portion of the light signal reflected off the top surface of the substrate to produce a diffraction pattern within the substrate." None of the art of record teaches or suggests the recited subject matter.

As noted above, *Chen* does not teach diffractive optical elements, *a fortiori*, it does not teach a holographic optical element having a plurality of spaced-apart strips disposed to "produce an output signal phase shifted from a second portion of the light signal reflected off the top surface of the substrate to produce a <u>diffraction pattern</u> within the substrate," as recited in claim 1. Instead, *Chen* describes a series of individually controlled actuators for creating frustrated total internal reflection or for fully removing an incoming signal from a substrate. Furthermore, as demonstrated in figures 1 and 2, *Chen* is designed so that each actuator operates on a single wavelength component of a broadband input. That is, each wavelength component engages one actuator, not multiple actuators. *Chen* does not teach the recited subject matter and there is no teaching, suggestion, or motivation to modify *Chen* into the recited subject matter.

The rejections of independent claim 27 and dependent claims 28-43 are traversed.[1]

Independent Claim 44

Claim 44 recites a 1xN optical switch having:

> N diffractive optical elements disposed above a top surface of the substrate and each individually moveable relative to the substrate between a first position substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second position within evanescent field coupling with the optical signal to alter the propagation of the optical signal into a second direction, where N is an integer greater than 0.

Claim 44 recites N diffractive optical elements, each individually moveable.

For at least the reasons outlined above, claim 44 is neither taught nor suggested by the art of record. The rejections of claim 44 and claim 45 depending therefrom are traversed and reconsideration requested.

Independent Claim 46

As amended, claim 46 recites:

> an optical switch for use with a substrate, the optical switch comprising:
>
> a plurality of strips disposed above a top surface of the substrate for movement relative to the substrate, each strip being spaced apart a spacing distance and having a strip width, whereby the sum, 'a', of the spacing distance and the strip width is chosen such that a light signal traveling within the substrate under total internal reflection along a first plane and incident upon an area of the top surface below said strips is reflected into a first diffracted order propagating within the substrate in a reflected direction of propagation along a second plane defining an acute angle, θ_p, with respect to the first plane and propagating within the substrate under total internal reflection.

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[1] The applicants note that dependent claim 38 is rejected based on a purported combination of *Kimura* and *Chen*. The applicants separately traverse that rejection because the office action has not provided the requisite *prima facie* showing of obviousness. The office action points to no teaching in the prior art of a desirability to move the strips of *Chen* in unison, as suggested. In fact, *Chen's* desirability to allow individual control of the reflection of each of the different wavelength components would appear to teach against such movement. If the actuators moved in unison, then individual signals could no longer be added or dropped independently, for example.

Claim 46 clarifies that the angle θ_p is between a first plane and a second plane. *Chen*, however, as noted above, uses an actuator structure that selectively frustrates or reflects light within in a single plane. *Chen* does not diffract light into a second plane different than an incident plane, for example.

The rejections of claim 46 and dependent claims 47 and 48 are traversed and reconsideration respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that the pending application is in condition for allowance.

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Respectfully submitted,

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